DelDOT's Priority Bridges

August 13, 2007
February 4, 2008
July 23, 2008

Summary

In light of the August 2007 bridge collapse in Minneapolis, Minnesota, DelDOT Secretary Carolann Wicks and the DelDOT Bridge Management Section recognized the potential benefits of stepping up the frequency of inspections for some bridges while remaining vigilant on completing the design plans for construction on our high priority bridges. While inspections were stepped up, procedures reviewed -- and in some cases revised -- no new problems with DelDOT's priority bridges were found as a result. In fact, DelDOT made significant progress in repairing/replacing 11 bridges that were identified on the first version of this report in August 2007.

In addition, DelDOT followed the directives from the U.S. Department of Transportation to review issues that could have been factors in the Minnesota bridge collapse, including:

- States should calculate how possible changes in bridge weight, capacity or evolving bridge conditions will affect gusset plates as part of their work to ensure bridge safety. *DelDOT reviewed bridges with gusset plates and all were deemed in good condition. Further, there are no circumstances where "changes in bridge weight, capacity or evolving conditions" would warrant concern for gusset plates.*
- Additional weight placed on bridges during construction or repair projects may put additional stress on gusset plates. *DelDOT does not and has not stockpiled construction materials or stored equipment on bridge decks during construction.*
- Immediate inspection of any steel deck truss bridges similar to the I-35 bridge that collapsed in Minnesota. *DelDOT gave its only steel deck truss bridge -- the Augustine Cutoff Bridge in Wilmington – a complete inspection August 7, 2007, and performed a structural analysis of the gusset plates in May 2008. Neither inspection nor the structural analysis uncovered anything new. The Augustine Cutoff Bridge is not structurally deficient.*

Based on the latest data from the U.S. Department of Transportation's National Bridge Inventory for states, DelDOT's percent of structurally deficient bridges is the fourth lowest in the nation behind Arizona, Florida and Nevada. Also, in comparing Delaware to states that are similar either geographically in size or numbers of bridges, DelDOT has the second lowest percent of structurally deficient bridges, behind only Nevada.

DelDOT's Bridge Program is part of its core business and if funding levels remain adequate as they are now, the bridge program will continue to be one of the best in the nation. While many states are struggling to dedicate sufficient funds to their bridge programs, Delaware has made this a priority.

Overview of Information

Below is a summary of DelDOT's path forward as of August 13, 2007, with updates in February 2008 and July 2008.

While we are confident that our bridges are safe and that our bridge program remains one of the very best in the nation, the DelDOT bridge staff announced the following, with updated information:

- **Bridge 1-585 on Augustine Cutoff** received a complete hands-on inspection August 7, 2007. The August inspection indicated as we expected that the bridge remains sound and safe. The inspection frequency was stepped up to every 12 months. Review of the gusset plates were also done at the time of inspection and all were in solid condition. UPDATE February 2008: As a result of a recent NTSB report in regards to the Minneapolis bridge, we will further analyze the gusset plates to ensure that they have adequate structural capacity. This will be completed within three months. UPDATE July 2008: The gusset plates were analyzed in May 2008 and no problems were identified, and no concerns were discovered. This bridge has been returned to its 24-month inspection cycle.
- **Bridge 1-503 St. Anne's Church Road** had a hands-on inspection the week of August 13, 2007 and February 2008. The inspection frequency was stepped up to every 6 months The bridge is posted for a 3-ton weight limit. UDPATE February 2008: The bridge was closed during the week of January 14, 2008 to make repairs to the bridge deck (essentially to fill large pot holes). This extended the life of the bridge until it can be replaced in 2009. UPDATE July 2008: The bridge replacement contract is planned for advertisement winter 2008, and construction anticipated in spring 2009.
- **Bridges 1-001 Rising Sun Lane** was placed on a six-month inspection cycle. Inspected on November 27, 2007, and in April 2008. UPDATE February 2008: Cracks were repaired, and the bridge will remain on a 6-month inspection frequency. A public workshop was held Jan. 8, 2008 to discuss design plans with the public. UPDATE July 2008: Bridge repair contract is planned for advertisement winter 2008, and work will begin in spring 2009.
- **Bridge 1-159 James Street** in Newport was placed on a six-month inspection cycle. Inspected on October 3, 2007, and in April 2008. UPDATE February 2008: We are working with DelDOT's North District Maintenance to install temporary supports under the floor beams and stringers until the bridge rehabilitation project is completed. The bridge will remain on a 6-month inspection frequency. UPDATE July 2008: The supports were installed in February 2008. Repairs/replacement planned for 2010. This bridge first showed up as structurally deficient in 2006.
- **Bridge 1-687 Walnut Street** in Wilmington was placed on a six-month inspection cycle, with those occurring on November 8, 2007, and in April 2008. UPDATE February 2008: The bridge was load-posted. The bridge will remain on a 6-month inspection frequency. UPDATE July 2008: Rehabilitation is planned for 2010.
- **Bridge 501, 501A and 501B SR 141 Newport Viaduct** first appeared as structurally deficient after an inspection in March 2008. Immediate repairs were made to significant cracks, and major project rehabilitation is planned for 2010.
- The load ratings are being reviewed and analyzed for all fracture critical bridges to make sure the ratings match the inspection data. UPDATE February 2008: This was done. The load ratings are checked with each inspection and found to be accurate.

- Eight fracture critical bridges are inspected on a 6-month frequency because their structural evaluation is 4 (Based on a scale of 1-9 with 1 being worse) or less. Seven are inspected on a 12-month frequency because their structural evaluation is 5. One bridge (Augustine Cutoff Bridge) was inspected on a 12-month frequency because it is a steel deck truss. Thirteen are inspected on a 24-month frequency because their structural evaluation is 6 or greater. UPDATE July 2008: See above regarding gusset plate analysis on Bridge 1-585 (Augustine Cutoff)
- Structurally deficient bridges will remain our top priority in our bridge program for inspection and rehabilitation or replacement.
- Where underwater inspections are needed, we may supplement our resources with consultant dive teams.

Terminology:

- The term "structurally deficient" is simply an engineering term that, for DelDOT, means there is a component on a bridge that needs attention. All 40 structurally deficient bridges (only 2.7 percent of all DelDOT bridges) on this list are either being worked on now or are planned to be worked on through our normal program. Also, of the 40, 17 are simply roads over pipes/culverts.
- The term "fracture critical" indicates that if one main component of a bridge of this design were to fail, the entire structure could fail. It should be noted that a fracture critical bridge may not be structurally deficient.
- The scoring (called structural evaluation in charts) below is from 1 to 9, with 9 being defined as "superior," 8 "equal to present desirable criteria," 7 "better than present minimum criteria," 6 "equal to present minimum criteria," 5 "somewhat better than minimum adequacy to tolerate being left in place as is," 4 "meets minimum tolerable limits to be left in place as is," 3 "basically intolerable requiring high priority of corrective action," 2 "basically intolerable requiring high priority of replacement," 1 not used in rating code, 0, "bridge closed." Each bridge has many components that are evaluated under this score, but the overall rating is determined by the lowest of the ratings for superstructure, substructure or load capacity.

DelDOT's bridge inventory:

	Total	**Structurally Deficient**	**Functionally Obsolete**
All Bridges	1473	40 (2.7 %)	163
NBI Bridges	824	23 (2.7 %)	123
Fracture Critical	28	8	13

Notes:
NBI (National Bridge Inventory) bridges are greater than 20' in length
All of the Fracture Critical Bridges are NBI length

The bridge inspection review process was accomplished in the following order:

1. Structurally deficient deck trusses
2. Deck trusses that are not structurally deficient
3. Structurally deficient fracture critical bridges
4. Fracture critical bridges that are not structurally deficient

5. Structurally deficient bridges of any type
6. Bridges Repaired/Rehabilitated since the August 2007 Report

1. Structurally deficient deck trusses

DelDOT does not own any structurally deficient deck trusses.

2. Deck trusses that <u>are not</u> structurally deficient

Bridge	Location	Structure Type	NBI	Insp Frequency	Next Insp	Str Eval
1-585	Augustine Cutoff over Brandywine Creek, Wilmington	Steel Deck Truss	Y	24 months	August 2009	6

Note: This is DelDOT's only steel deck truss bridge.

3. Structurally deficient fracture critical bridges

Bridge	Location	Structure Type	NBI	Insp Frequency	Next Insp	Str Eval	*	Construction Year
1-001	Rising Sun Lane over Brandywine Creek, N/W Wilmington	Steel Through Truss	Y	6 months	October 2008	3	D	Early 2009
1-159	James Street over Christina River, Newport	Steel Bascule Lift Bridge (not operational)	Y	6 months	October 2008	3	D	2010
1-687	Walnut Street over Christina River, Wilmington	Steel Bascule Lift Bridge	Y	6 months	October 2008	3	D	2010
1-503	St. Anne's Church Road over Norfolk Southern RR, Middletown	Steel Girder and Floor beam System	Y	6 months	August 2008	3	D	Spring 2009
1-501, 501A and 501B	SR 141, Newport Viaduct	Steel Box Girders	Y	6 months	August 2008	4	D	Spring 2008
1-693	Northeast Blvd over Christina River, Wilmington	Bascule Lift Bridge (draw bridge)	Y	6 months	November 2008	3	D	TBD

NOTES: Rising Sun Lane is a historic structure in an historic district, which requires an extensive and complex approval process; James Street became structurally deficient for the first time in 2006; SR 141, Newport Viaduct became structurally deficient for the first time in March 2008.

4. Fracture critical bridges that <u>are not</u> structurally deficient:

Inspection reports for the following fracture critical bridges were reviewed, and new inspections conducted. **There were no new concerns revealed.** Some of the bascule bridges had problems with the steel grid deck. **The inspection frequency for these bridges remains at 12 months.**

Bridge	Location	Structure Type	NBI	Insp Frequency	Next Insp	Str Eval
1-112	Yorklin Road over Red Clay Creek, Yorklyn	Pony Truss	Y	12 months	3/14/2009	5
1-119	SR 82 over Red Clay Creek, Ashland	Girder - Floorbeam System	Y	12 months	3/29/2009	5
1-577	Northeast Blvd over Brandywine Creek, Wilmington	Bascule Lift Bridge (not operational)	Y	12 months	5/7/2009	5
1-587	SR 141 over Brandywine Creek, Wilmington	Girder - Floorbeam System	Y	12 months	8/31/2008	5
2-021A	Rehoboth Blvd over Mispillion River, Milford	Bascule Lift Bridge	Y	12 months	11/7/2008	5
3-151	Front Street over Nanticoke River, Seaford	Bascule Lift Bridge	Y	12 months	11/8/2008	5
3-154	Savannah Road over Lewes Rehoboth Canal, Lewes	Bascule Lift Bridge	Y	12 months	7/26/2008	5

The latest inspection reports for the following fracture critical bridges were reviewed. These bridges are in better condition, with Structural Evaluation ratings of 6 or greater. Most of these bridges have been rehabilitated in recent years. The 24-month inspection frequencies will be maintained for these bridges.

Bridge	Location	Structure Type	NBI	Insp Frequency	Next Insp	Str Eval
1-155	Old Capital Trail over Red Clay Creek, Marshallton	Girder - Floorbeam System	Y	24 months	2/12/2009	6
1-216	Hopkins Road over White Clay Creek, Newark	Pony Truss	Y	24 months	6/5/2009	6
1-688	Markert Street over Christina River, Wilmington	Bascule Lift Bridge	Y	24 months	12/8/2008	6
1-745	I-95 over Norfolk Southern RR, Wilmington	Steel Girder w/ Steel Pier Caps	Y	24 months	6/21/02010	7
1-748	I-95, Wilmington Viaduct	Steel Girder w/ Steel Pier Caps	Y	24 months	3/26/2009	6
1-748N	I-95, Wilmington Viaduct	Steel Girder w/ Steel Pier Caps	Y	24 months	4/5/2009	6
1-748S	I-95, Wilmington Viaduct	Steel Girder w/ Steel Pier Caps	Y	24 months	3/19/2009	6
1-813	I-495 over Christina River, Wilmington	Girder – Floorbeam System	Y	24 months	12/4/2008	6
3-152	Central Avenue over Broad Creek, Laurel	Bascule Lift Bridge	Y	24 months	9/18/2008	6
1-693	Northeast Blvd over Christina River, Wilmington	Bascule Lift Bridge	Y	24 months	12/7/2008	7
3-152	Central Avenue over Broad Creek, Laurel	Bascule Lift Bridge	Y	24 months	9/18/2008	6
3-153	Rehoboth Avenue over Lewes Rehoboth Canal, Rehoboth	Bascule Lift Bridge	Y	24 months	11/8/2008	7

3-161	Poplar Street over Broad Creek, Laurel	Swing Bridge (not operational)	Y	24 months	9/18/2008	4*

** Note: Bridge 3-161 has a condition rating of 6. The structural evaluation of 4 is based on the original design load capacity.*

5. Structurally deficient bridges of any type

Inspection reports were reviewed for the following structurally deficient bridges, and all were in order. These bridges are currently in the Bridge Design program. As an added precaution, between August 2007 and June 2008, the Bridge Management Engineer visually inspected the deficient elements of each bridge on a monthly basis. No new issues were revealed, and the monthly reviews were extended to 3 months.

Bridge	Location	Structure Type	NBI	Insp Frequency	Next Insp	Str Eval	*	Construction Year
1-211A	Kirkwood Hwy over Pike Creek, Newark	Steel Girder	Y	3 months	Oct. 2008	4	D	Summer 2009
1-234	Kirkwood Hwy over Mill Creek, Newark	Steel Girder	Y	3 months	Oct. 2008	5	D	Summer 2009
2-222A	Sandy Bend Rd over Tappahanna Ditch, Marydel	P/S Concrete Girder	Y	3 months	Sept. 2008	4	D	Summer 2010

Inspection reports were reviewed for the following structurally deficient bridges, and all were in order. These bridges are currently in the Bridge Design program. As an added precaution, between August 2007 and June 2008, the Bridge Management Engineer visually inspected the deficient elements of each bridge on a monthly basis. No new issues were revealed, and the monthly reviews were discontinued. Each of the bridges were load posted and placed on a 6-month inspection frequency.

Bridge	Location	Structure Type	NBI	Insp Frequency	Next Insp	Str Eval	*	Construction Year
2-277A	Fox Hunters Road, W of Harrington	CM Pipe	Y	6 months	Oct. 2008	4	D	Summer 2010
3-405	Baker Road, W of Selbyville	CM Pipe	N	6 months	Nov. 2008	3	D	Fall 2010

Inspection reports were reviewed for the following structurally deficient bridges, and all were in order. These bridges are currently in the Bridge Design program. As an added precaution, between August 2007 and June 2008, the Bridge Management Engineer visually inspected the deficient elements of each bridge on a monthly basis. The bridges were repaired or replaced, and the monthly reviews were discontinued.

Bridge	Location	Structure Type	NBI	Insp Frequency	Next Insp	Str Eval	*	Construction Year
1-503	St Annes Church Road over NS Railroad, Middletown	Steel Through Girder	Y	6 months	August 2008	3	D	Spring 2009

Inspection reports were reviewed for the following structurally deficient bridges, and all were in order. However, as a precaution, the inspection frequency of most of the below bridges was moved up to either 6 or 12 month cycles for bridges with a Structure Evaluation of 4 or less.

Bridge	Location	Structure Type	NBI	Insp Frequency	Next Insp	Str Eval	*	Construction Year
1-001A	Rising Sun Lane over Brandywine Creek overflow, N/W Wilmington	Stone Arch	Y	12 months	April 2009	3	D	FY 09 & 10
1-100	Old Kennett Road, Centerville	Concrete Culvert	N	12 months	March 2009	4	D	FY10
1-110	Pyles Ford Road, N of Wilmington	Concrete Culvert	N	12 months	February 2009	4	D	FY10
1-130	Mt Cuba Road over Red Clay Creek, SE of Ashland	Steel Girder	Y	12 months	April 2009	4	M	2009
1-133	Breidablik Drive, Breidablik	CM Pipe	N	12 months	April 2009	4	1	To be determined
1-325	Otts Chapel Road, Newark	CM Pipe	N	12months	May 2009	3	D	FY10
1-330	Marrows Road, Newark	CM Arch	N	12months	May 2009	4	D	FY10
1-335	Old Cooches Bridge Rd, Newark (closed)	Timber	Y	12 months	April 2009	4	2	N/A
1-404	Cedar Lane Road, Middletown	CM Pipe	N	12 months	June 2009	4	3	
1-536	Guyencourt Road, N of Wilmington	Concrete Culvert	N	12months	April 2009	4	D	FY11
1-582	Alapocas Drive, Wilmington	Concrete Slab	N	12 months	March 2009	4		
1-652	Kiamensi Road, Newport	CM Pipe	N	6 months	September 2008	3	D	FY10
1-744	I-95 over Christina River, Wilmington	Steel Girder	Y	12months	March 2009	4	C	Under construction
2-040A	School Lane, Clayton	CM Pipe	Y	12 months	July 2008	4	3	To be determined
2-062C	Nine Foot Road	CM Pipe	N	12 months	September 2008	4	3	To be determined
2-203A	Todds Mill Road	Concrete Slab	Y	12 months	September 2008	4		To be determined
2-215B	Darling Farm Road, SE of Marydel	CM Pipe	N	6 months	October 2008	3	3	To be determined
2-254A	Mt Olive Cemetary Road	CM Pipe	Y	12 months	Sept. 2008	4	D	FY10
2-296A	Layton Corners Road, W of Harrington	CM Pipe	Y	12 months	Aug. 2008	4	D	FY10
3-120	Handy Road, West of Bridgeville	CM Pipe	Y	12 months	Aug. 2008	4	3	To be determined
3-156	SR 1 over Indian River Inlet	Steel Girder	Y	12 months	Aug. 2008	4	D	Begin 2008
3-408	Pepper Road over Polly Branch, Selbyville	CM Pipe	Y	6 months	January 2009	3	3	FY10
3-462	Bear Hole Road, E of Selbyville	CM Pipe	Y	12 months	Aug. 2008	4	D	FY10
3-658	Warrington Road, SE of Georgetown	CM Pipe	N	6 months	October 2008	2	3	To be determined
3-682	Gravel Hill Road over deep Creek, Sw of Georgetown	CM Pipe	N	12 months	June 2009	4	3	To be determined
3-710	Beaver Dam Road over Chapel Branch, E of Georgetown	CP Pipe	N	12 months	June 2009	4	3	To be determined
3-925	Lighthouse Road, N of Slaughter Beach	Timber	N	12months	July 2008	4	D	FY10

*In the above charts, the column labeled * identifies bridges as follows: C = The bridge is currently under construction. D = The bridge is currently in the Bridge Design Program. M = The bridge is currently in the Structure Maintenance Program. If there is a numeral in the * column, see below for an explanation.*

1. Breidablik Drive was part of a subdivision street recently turned over to the state for maintenance, and its deficiency is that the pipe has corrosion. Repairs will be made by North District Maintenance as soon as environmental permits are obtained.
2. Old Cooches Bridge is on a roadway no longer open to traffic, and therefore not used. The timber deck and stringers were replaced in June 2008, to allow access to farm fields beyond the bridge. The repaired bridge has a 15-ton load posting.
3. Pipe has corrosion.

6. Bridges Repaired/Rehabilitated since the August 2007 Report

Bridge 1-061, Glenrock Drive over S. Branch Naamans Creek, W. of Claymont
Bridge 1-609C, Seventh St., CSX Railroad, Wilmington (was permanently removed in 2007)
Bridge 1-711, Salem Church Road over I-95, Newark
Bridge 2-292A, Bullock Road, W. of Harrington
Bridge 2-307A, Gallo Road over Green Branch Ditch, W. of Farmington
Bridge 2-455D, Fox Hunters Road, W. of Harrington
Bridge 1-118, Barley Mill Road over Red Clay Creek
Bridge 3-434, Roxana Road, NE of Selbyville
Bridge 1-127, Sharpless Road over Red Clay Creek
Bridge 1-176, Robin Court, Hockessin (under construction as of 7.15.8)
Bridge 1-609B, Sixth St. over CSX RR, Wilmington